

NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT

BIOGRAPHICAL DATA SHEET

NAME: Mark K. Craig

ORAL HISTORY: 24 March 2006, 11 April 2006, 2 May 2006

EDUCATION:

- B.S. Aeronautical & Astronautical Engineering, Purdue University (1971)
- Graduate Studies in Engineering, Rice University (1974-1983)
- Program for Senior Executives, MIT Sloan School (1992)

SELECTED HONORS AND AWARDS:

- Rotary National Award for Space Achievement Stellar Award (2016)
- Flag flown over the U.S. Capitol at the request of Rep. Joseph P. Kennedy III to recognize Mark Craig's 48 years of service to the Nation's space program (2015)
- Fellow, American Astronautical Society (2006)
- NASA Distinguished Service Medal (2005)
- Distinguished Engineering Alumnus, Purdue University (2002)
- Outstanding Aerospace Engineer, Purdue University (2000)
- Presidential Meritorious Executive Rank Award (1994, 1999)
- NASA Outstanding Leadership Medal (1992)
- Elected to the International Academy of Astronautics (1992)
- Federal Engineer of the Year Award, National Society of Professional Engineers (1991)
- NASA Exceptional Service Medal (1981, 1990)
- Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA) (1981)
- Professional Service Award, AIAA Houston Section (1978)
- Community Service Award, AIAA Houston Section (1976)

PROFESSIONAL AND HONORARY SOCIETIES:

- International Academy of Astronautics (IAA)
- American Astronautical Society (AAS): President (2005-2007), Executive Vice President (2003-2005), Vice President - Technical (2002-2003)
- American Institute of Aeronautics and Astronautics (AIAA): National Student Activities Committee (1976-1981), Houston Section Councilor (1974-1975)
- College Art Association
- National Eagle Scout Association

SELECTED EXPERIENCES:

- Learning human space flight from its inventors, and working with its amazing team since;
- A one-on-one meeting with Neil Armstrong the day he learned he would command Apollo 11;
- Being detained at the Apollo 11 pad the afternoon before launch, and experiencing its launch the next day;
- Experiencing weightlessness leading a test campaign on NASA's "zero-g" aircraft;
- Inspecting the fully fueled Space Shuttle on the pad just before launch;
- In the White House, making Lunar-Mars exploration presentations to the Vice President;
- Being on console in the Launch Control Firing Room, and experiencing 30 Shuttle launches;
- Being on the startup team of Space Shuttle (1969) as a co-op, of Space Station (1983) as a lead engineer, and of the Lunar-Mars exploration initiative (1989) as Assistant Administrator.

SELECTED CONTRIBUTIONS:

- Working to shape NASA human space exploration to strengthen and expand its stakeholder relevance such that sustainability and stability are inherent. Then, unlike Apollo, just reaching a destination will not result in termination - no Moon AND Bust, no Mars AND Bust.
- Leading engineering negotiations that resulted in Space Station partnerships with Europe, Japan, and Canada;
- Leading the first all-NASA, multi-agency studies of integrated Lunar-Mars human exploration;
- Leading the design, development, test, and evaluation of the Space Shuttle booster staging system that worked successfully on each of the Shuttle's 135 flights;
- Helping to create the Shuttle Launch Experience and Space Shuttle Atlantis Exhibit at the Kennedy Space Center Visitor Complex.

NASA CAREER:

2002-2005 *Associate Center Director (Space Development and Commerce), Johnson Space Center*; For the Director, responsible for identifying and enabling strategic investments; led integration of the Space Shuttle Service Life Extension Program (SLEP) investment plan; led integration of Agency Strategic Roadmaps.

2001-2002 *Director (acting), Stennis Space Center*; responsible for management of the Center and its rocket propulsion test, Earth science, and commercial remote sensing programs and its multi-Agency environment; founding Chair of the National Rocket Propulsion Test Alliance.

1995-2002 *Deputy Director, Stennis Space Center*; with the Director, responsible for management of the Center and its rocket propulsion test, Earth science, and commercial remote sensing programs and its multi-Agency environment.

1993-1995 *NASA Strategic Plan Architect, Administrator's Staff (NASA HQ)*; with Agency senior leadership, facilitated creation of the NASA Strategic Plan and Strategic Management System architectures; creator of the Strategic Enterprise concept and the Human Exploration and Development of Space (HEDS) Enterprise; architect of the HEDS strategy.

NASA CAREER (continued):

1991-1993 *Manager for Space Station Technical Projects* (NASA JSC); led integrated Long Duration Orbiter/Space Station study to increase early on-orbit capability; led assessment of JSC program control capability; served on Administrator's "Red Teams" for assessing NASA strategy, human spaceflight programs, and NASA Center roles and missions.

1989-1991 *Assistant Administrator for Exploration (acting) then Director for Space Exploration (acting)* (NASA HQ); led NASA's planning and research to establish a lunar base and to send humans to Mars, and led coordination with the Dept. of Defense, Dept. of Energy, National Science Foundation, and National Institutes of Health; served as NASA's principal Space Exploration Initiative (SEI) liaison with the White House National Space Council; drafted the initial Space Council SEI policy; negotiated and signed the cooperative agreement with NSF on joint Antarctic research.

1987-1989 *Manager, Lunar and Mars Exploration then Manager, Lunar and Mars Exploration Program* (NASA JSC); led development of NASA's integrated strategy for exploration of the Moon and Mars and for enabling research, technology, and infrastructure; was lead NASA technical resource for White House staff in developing the Space Exploration Initiative (SEI) for announcement by President Bush on the Apollo 11 20th anniversary in 1989.

1987-1989 *Deputy Manager, Mars Rover Sample Return Project* (NASA JSC/JPL); led JSC concept development, technology, and science efforts; with JPL, responsible for project management and technical negotiations with Europe and the Soviet Union on project participation.

1987 *Special Assistant for Shuttle to the Director of Engineering* (NASA JSC); Directorate focal point for support to both the Space Shuttle program and Orbiter project, and was Engineering Directorate representative on their management boards.

1986-1987 *Manager (acting), Space Station Program Systems Engineering and Integration* (NASA JSC); led SE&I of the integrated Space Station system, including international partners; chaired the Space Station Systems Integration Board.

1985-1986 *Assistant Manager (Engineering), Space Station Program Systems Engineering and Integration* (NASA JSC); principal advisor to the SE&I Manager on engineering issues; senior engineering representative in negotiations to create partnerships with Europe, Japan and Canada.

1984-1985 *Lead Engineer, Space Station "Skunk Works"* (NASA JSC); supported formation of the Space Station Level B Program Office at JSC and its transition from the HQ Space Station Task Force.

1983-1984 *Lead Engineer, Space Station Task Force Concept Development Group (CDG)* (NASA HQ); led twelve of eighteen CDG multi-Center teams in Space Station configuration development studies and related technical and programmatic analyses.

NASA CAREER (concluded):

1981-1984 *Head, Space Shuttle Program Flight Debris Team* (NASA JSC); formed and led the Space Shuttle program debris team created by the Shuttle Program Manager after STS-1 to identify, assess, and remediate launch, flight, and landing debris; led its pre-launch and post-landing vehicle inspection team.

1977-1983 *Subsystem Manager then Integration Manager, Space Shuttle Solid Rocket Booster (SRB) Separation System* (NASA JSC); led the design, development, test, and evaluation (DDT&E) of the integrated Space Shuttle Solid Rocket Booster (SRB) staging system which worked successfully on each of the Shuttle's 135 flights; staging flight software principal function manager and staging aerodynamics Air Force hypersonic wind tunnel test campaign sponsor and designer.

1971-1983 *Aerospace Engineer, Engineering Directorate*, (NASA JSC); supported Space Shuttle concept analyses; member of Apollo-Soyuz Working Group 3 on docking; supported analyses of Space Shuttle staging dynamics and aerodynamics; invented the "Hypercube" technique to efficiently acquire and access 8-dimensional Shuttle booster staging aerodynamic data; led math modeling and "zero-g" aircraft test campaign of Space Shuttle large amplitude propellant slosh for Return-To-Launch-Site (RTLS) aborts.

1967-1969 *Co-op student* (NASA MSC); supported Astronaut training equipment redesign after the Apollo 1 fire; performed parametric Venus entry trajectory study with recent Soviet Venera atmosphere data; youngest member of 1969 Space Shuttle concept development "skunk works."

BEYOND NASA CAREER:

2008-2015 *NASA Account Manager* (Science Applications International Corporation, SAIC); managed SAIC's relationship with NASA by helping SAIC understand and best meet NASA's needs and by helping NASA understand SAIC's capabilities; worked to increase NASA human space exploration's relevance and sustainability by helping to shape and socialize the bi-partisan NASA Authorization Act of 2010 and its mandated National Academies study, and by helping to organize the 2014 Atlantic Council/SAIC Final Frontier event, the 2015 Pioneering Space National Summit, and various conferences including the TED-like AAS Imagine'09. Led the effort which rebranded the Mars Affordability Workshop to be the Mars Affordability and Sustainability Workshop.

2005-2008 *Vice President, Manager of Space and Ocean Systems Solutions Operation* (Science Applications International Corporation, SAIC); managed SAIC's space and Earth science business with NASA and other federal agencies.

1997- *Museum & Themed Attraction Space Exploration Consultant*; as member of the creative team, provides space exploration expertise to museums and themed attractions developing space-related projects. Clients to date have included Chicago's Museum of Science and Industry, Space Centre Bremen (Germany), and the NASA Kennedy Space Center Visitor Complex Shuttle Launch Experience and Space Shuttle Atlantis Exhibit.

SELECTED PUBLICATIONS:

Reporting on Strategic Considerations About the Role of Science in Initial Human Missions to Mars; Committee on Space Research (COSPAR), Istanbul Turkey, August 2016 (with D. Beaty, H. Thronson, et al).

Issues and Challenges in Sustainability; Third Community Workshop on Mars Affordability and Sustainability, Washington DC, December 2015 (with M. L. Dittmar, D. Dumbacher, and A. Zulkosky)

The Exploration <-> Development of Space “Engine;” IAA Paper No. IAA - WAS0401, International Academy of Astronautics Space Exploration Conference, Washington DC, January 2014.

NASA Human Spaceflight 3.0; AAS Space Times, Vol. 51, No. 3, May/June 2012, p. 7-9.

How to Reduce Churn in NASA Human Space Exploration; Space News Op/Ed, Dec. 14, 2011.

NASA’s Value to the Nation: 50 years of Lessons on Sustainability; AIAA paper No. 2007-9931, AIAA SPACE 2007 Conference, September 2007.

Achieving Profound Public Engagement - The Ultimate Source of Exploration Vision Sustainability; AIAA paper No. 2005-2568, 1st Space Exploration Conference, January 2005.

Re-Energizing Relevance: Building the Psychological Highway to Space; IAA/ESA Workshop on Next Steps in Exploring Deep Space, October 2003, Noordwijk, Netherlands (with R. Rogers).

NASA Exploration and Discovery for the New World. Branding and Re-branding for the 21st Century Conference, University of Texas at Austin, May 2003.

Idea Generation and NASA Strategy: Approaches, Technologies, Results. MDP Annual Congress of CIES, Edinburgh Scotland, October 2000.

Space Activity in the 21st Century; 3rd United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna Austria, July 1999.

Setting Program Requirements; *NASA Program/Project Management Conference Report*, NASA SP-6101-07, 1993, p. 13.

The Space Exploration Initiative; Paper No. 91-428, 42nd IAF International Congress, Montreal, Canada, October 1991 (with A. Aldrich and D. O’Handley).

The Outbound Trail - Human Exploration of the Moon and Mars; Association of Space Explorers, 7th Planetary Congress, Berlin Germany, October 1991.

SELECTED PUBLICATIONS (continued):

Technology Needs of the Exploration Initiative; Paper No. 90-032, 41st IAF International Congress, Dresden, Germany, October 1990 (with A. Aldrich, R. Rosen, and J. Mankins).

A Vision for Space; Bicentennial Celebration of U.S. Patent and Copyright Laws, Bicentennial Celebration of U.S. Patent and Copyright Laws - Proceedings, Events and Addresses, Port City Press, 1990, p. 685-693.

An International Mars Exploration Program; Paper No. 89-493, 40th IAF International Congress, Malaga, Spain, October 1989 (with D. Rea, G. Cunningham, and H. Conway).

The Diverse Role of Unmanned Precursors in Supporting Manned Missions to Mars; Paper No. 89-496, 40th IAF International Congress, Malaga, Spain, October 1989.

The Case for a Multinational Mars Surveyor Program; The Planetary Report, Vol. IX, No.5, 1989, p. 12-15 (with D. Rea and M. Carr).

Integrated Strategies for the Exploration of Mars; Paper No. 88 391, 39th IAF International Congress, Bangalore, India, October 1988.

Strategic Options for a Lunar Base; Paper No. 88-615, 39th IAF International Congress, Bangalore, India, October 1988 (with B.B. Roberts).

Mars Rover Sample Return Mission; Committee on Space Research (COSPAR), Helsinki Finland, July 1988 (with D. Rea, M. Carr, and J. Martin).

Exploration of the Solar System: Opportunities and Pathways; American Astronautical Society 21st Century in Space Symposium, St. Louis Mo., 1988.

Space Station Overview; Proceedings, Canadian Engineering Centennial Convention, The Canadian Society for Mechanical Engineering, Montreal, Canada, 1987.

Space Station Design - Innovation and Compromise; Aerospace America, Vol. 22, No. 9, Sept. 1984, p. 70-72 (with L. Powell and A. Cohen).

Problems and Concepts of Space Station Guidance, Navigation and Control; Paper No. 84-1139, AIAA Space Systems Technology Conf., Costa Mesa, Ca., June 1984 (with A. Guha).

Rocket Exhaust Plume-Induced Flowfield Interaction Experiences with the Space Shuttle; Paper No. 83-1549, AIAA Thermophysics Conference, Montreal, Canada, June 1983 (with B. Roberts, R. Wallace, and D. Kanipe).

Shuttle Booster Separation Aerodynamics; Space Shuttle Performance Lessons Learned Conference Report, NASA CP-2283, 1983, p. 139-157 (with H. Dresser).

SELECTED PUBLICATIONS (concluded):

Shuttle Launch Debris - Sources, Consequences, Solutions; Space Shuttle Performance Lessons Learned Conference Report, NASA CP-2283, 1983, p. 159-185.

An Analytical Tool for Simulating Large Amplitude Propellant Slosh; Paper No. 81-0500, AIAA Dynamics Specialists Conference, Atlanta, Ga., April 1981 (with R. Berry et al).

Shuttle Small Self-Contained Payloads: "Getaway" to the Educational Opportunities of Space, Paper No. 78-135, AAS Future of the United States Space Program Conference, Houston, TX, Oct. 1978 (with T. Murtagh and C. Jacobson).

An Analysis of Atmospheric Entry Trajectories for Manned and Unmanned Missions to the Planet Venus; NASA TN D-7316, 1973 (with R. Gonzales).

Vehicle Performance Impact on Space Shuttle Design and Concept Evaluation; Space Shuttle Aerothermodynamics Technology Conference Report, NASA TM X-2509, 1971.

A Design Parameter Synthesis Derived from a Mathematical Analysis of a Hypothetical Lunar Flying Vehicle, NASA GWP 10084, 1969 (with W. Jacqmein and D. Hall).

Apollo Spacecraft 105 Testing. Purdue Engineer, Vol. 64, No. 1, October 1967, p. 52-56.

PERSONNEL FILE ADMINISTRATIVE RECORD:

NASA Manned Spacecraft Center/Johnson Space Center, Houston, TX (1967-1983)

- Co-op, Aerospace Engineer, Test Facilities Branch, Engineering Division, Assistant Director for Administration (1967-1968)
- Co-op, Aerospace Engineer, Flight Performance & Dynamics Branch, Advanced Spacecraft Technology Division (1968-1969)
- Co-op, Aerospace Engineer, Flight Technology Branch, Engineering Analysis Office (1969-1971)
- Aerospace Engineer, Flight Performance Section, Flight Technology Branch, Engineering Analysis Division, Director of Engineering and Development (1971-1972)
- Aerospace Engineer, Preliminary Design Office, Spacecraft Design Division (1972-1973) Aerospace Engineer, Analytical Support Section, Engineering Technology Branch, Spacecraft Design Division (1973)
- Aerospace Engineer, Launch Analysis Section, Integrated Flight Analysis Branch, Engineering Analysis Division, Director of Engineering and Development (1973-1974)
- Aerospace Engineer, Aerodynamic Systems Analysis Section, Aerodynamics Branch, Engineering Analysis Division, Director of Engineering and Development (1974-1979)
- Aerospace Engineer, Integrated Entry Analysis Branch, Engineering Analysis Division, Director of Engineering and Development (1979-1982)
- Aerospace Engineer, Systems Integration Branch, Systems Engineering Division (1982-1983)

PERSONNEL FILE ADMINISTRATIVE RECORD (concluded):

NASA Headquarters, Washington, D. C. (1983-1984)

- Space Station Task Force, Concept Development Group

NASA Johnson Space Center, Houston, TX (1984-1990)

- Aerospace Engineer, Systems Integration Branch, Systems Engineering Division (1984-1985)
- Aerospace Engineer, Systems Engineering and Integration Office, Space Station Program Office (1985)
- Acting Manager, System Engineering and Integration Office, Space Station Program Office (1986-1987)
- Special Assistant to the Director, Engineering Directorate (1987)
- Manager, Lunar & Mars Exploration Office, New Initiatives Office, Office of the Director (1987-1990)
- Manager, Lunar & Mars Exploration Program Office, Office of the Director (1990-1991)

NASA Headquarters, Washington, D. C. (1991-1992)

- Acting Director for Space Exploration, Special Assistant for Exploration, Aeronautics Exploration and Technology (1991)
- Office of Aeronautics and Space Technology (1992)

NASA Johnson Space Center, Houston, TX (1992-1995)

- Manager for Technical Projects, Space Station Projects Office (1992-1995)

NASA Stennis Space Center, Bay Saint Louis, MS (1995-2002)

- Deputy Director, Center Director's Office (1995-2001)
- Acting Director, Center Director's Office (2001-2002)

NASA Johnson Space Center, Houston, TX (2002-2005)

- Associate Director, Space Development and Commerce, Office of the Director

BIOGRAPHICAL REFERENCES:

Mark K. Craig collection in The Barron Hilton Flight and Space Exploration Archives at Purdue University, <http://collections.lib.purdue.edu/flight-and-space/index.php>

Mark K. Craig, et. al., eds., Human Exploration & Development of Space: Strategic Plan (Washington, D.C.: NASA, 2000).

“1999 Meritorious Executive Award,” U.S. Office of Personnel Management Homepage, Online, <http://www.opm.gov/ses/99merit.asp> (Accessed 25 May 2005).

“Awards and Honors,” Purdue Engineering Homepage, Online, https://engineering.purdue.edu/Engr/AwardsAndHonors/DEA/DEA_2002/craig (Accessed 26 May 2005).

Assistant Director for Administration (February 1966), Organizational Charts (Boxes 13 and 14), Organizational Files, Center Series, JSC History Collection, University of Houston-Clear Lake, University Archives, Houston, TX.

BIOGRAPHICAL REFERENCES (continued):

“Craig gets high post at Stennis,” Space News Roundup (NASA Lyndon B. Johnson Space Center), 10 February 1995, 4.

Engineering Division (1 December 1965), Organizational Charts (Boxes 13 and 14), Organizational Files, Center Series, JSC History Collection, University of Houston-Clear Lake, University Archives, Houston, TX.

Johnson Space Center Announcement, “Key Personnel Announcement – Mr. Mark K. Craig,” JSC 02-048, 11 October 2002, <http://announcements.jsc.nasa.gov/02-048.html> (Accessed 25 May 2005).

Johnson Space Center Announcement, “Organization and Personnel Assignments of the Spacecraft Design Division,” JSC 73-126, 20 September 1973, Box GR1015, General Reference Series, JSC History Collection, U of H -Clear Lake, University Archives, Houston, Texas.

Johnson Space Center Management Instruction, “Functions and Organization-Engineering Analysis Division,” JSC 1142.21A, 19 July 1979, Box GR1020, General Reference Series, JSC History Collection, University of Houston-Clear Lake, University Archives, Houston, Texas.

Mark K. Craig, interview by Howard E. McCurdy, 15 March 1991, Transcript, Oral History Collection, JSC History Collection, U of H - Clear Lake, University Archives, Houston, TX, 103-109.

Manned Spacecraft Center Announcement, “Reorganization and Personnel Assignments Engineering Analysis Division Engineering and Development Directorate,” MSC 73-1, 12

January 1973, Box GR1015, General Reference Series, JSC History Collection, University of Houston-Clear Lake, University Archives, Houston, Texas.

Mark K. Craig Service Record Card, Mark K. Craig Personnel File, Human Resources Office, NASA Lyndon B. Johnson Space Center, Houston, TX.

NASA Headquarters Telephone Directories (1984, 1991-1992) Organization Files, Center Series, JSC History Collection, University of Houston-Clear Lake, University Archives, Houston, TX.

NASA Lyndon B. Johnson Space Center Telephone Directories (1973-2002), Organization Files, Center Series, JSC History Collection, U of H - Clear Lake, University Archives, Houston, TX.

NASA Manned Spacecraft Center Telephone Directories (1967-1972), Organization Files, Center Series, JSC History Collection, U of H - Clear Lake, University Archives, Houston, TX.

“NASA recognizes 150 from JSC with Honor Awards,” Space News Roundup (NASA Lyndon B. Johnson Space Center), 17 April 1992, 1.

BIOGRAPHICAL REFERENCES (concluded):

NASA Stennis Space Center Telephone Directory (1996) Organization Files, Center Series, JSC History Collection, University of Houston-Clear Lake, University Archives, Houston, TX.

“S&MA SAIC Team Newsletter; March/April 2005,” Johnson Space Center Safety and Mission Assurance Homepage, Online, <http://sma.jsc.nasa.gov> (Accessed 16 June 2005).

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